Abstract Submitted to the
International Conference on Strongly Correlated Electron Systems
University of Michigan, Ann Arbor
August 6-10, 2001

Studies of Optical Response Across the Phase Diagram of $YbIn_{1-x}Ag_xCu_4$

Jason Hancock[1], Tim McKnew[1], Sonya Hoobler[1], Zack Schlesinger[1], John Sarrao[2], Zach Fisk[3]

[1] *University of California Santa Cruz*
[2] *Los Alamos National Laboratory*
[3] *Florida State University,NHMFL*

$YbIn_{1-x}Ag_xCu_4$ has an intriguing phase diagram with a first-order electronic phase transition in pure $YbInCu_4$ beginning a line of transitions that ends in a critical point at x$\simeq$0.3. These transitions separate a high temperature magnetic phase from a mixed-valent state which persists to low temperatures. While low-temperature behavior seems consistent with the periodic Anderson model (PAM), that model contains no phase transitions (only crossovers). Thus there may be interactions outside the scope of that model which are important to understanding the essential nature of $YbIn_{1-x}Ag_xCu_4$, one possibility being a Mott-Hubbard-like Coulomb interaction. To explore the basic physics and phenomenology of $YbIn_{1-x}Ag_xCu_4$ we have studied the infrared and optical response of 5 samples with different x values. Using measured reflectivity and a Kramers-Kronig transform we obtain electrical conductivity as a function of frequency and temperature at various doping concentrations. Analysis has revealed both high-frequency spectral weight redistributions and the emergence of a distinct 0.25 eV mode at low temperature. Interesting aspects of these data include the evolution of this mode, its relationship to the Abrikosov-Suhl resonance, and the relationship of the higher frequency spectral weight shifts to exhaustion and other theoretical issues.